Creating A Superstar Musical Group: Making Sound

Performance Task

Introduction

Introduction for Teachers

Here are the Next Generation Science Standards this Task Meets:

- PHYSICAL SCIENCE
  - Waves and Their Applications in Technologies for Information Transfer - Students who demonstrate understanding can:
    - (MS-PS4-2.) Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- ENGINEERING DESIGN
  - Engineering Design - Students who demonstrate understanding can:
    - (MS-ETS1-2.) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Introduction for Students:

Your musical group has decided to create your own instruments. To do this you will need to understand how musical instruments create sound. You will also need to understand how musical instruments can create a variety of different sounds. Your instruments will need to make music that helps your group excite people to help you win the Rising Star competition. To create these instruments you will need to investigate properties of sound including waves, pitch, and frequency. Once you understand these properties it will be time to create your instruments and make beautiful music!

Big Idea / Essential Questions

Big Idea

- Sound can make matter vibrate, and matter can make sound.
- Waves carry energy from one location to another without the transfer of energy.
- A technological world requires that humans develop capabilities to solve technological challenges and improve products for the way we live.
- The skills, techniques, elements and principles of the arts can be learned, studied, refined and practiced.

Essential Questions

- What causes sound?
- How is energy transferred by waves?
- How do people use music?

G.R.A.S.P.

Goal

Your group has decided to compete in the "Rising Star" competition that is looking to create the next superstar musical group. This competition encourages creativity and is looking for a musical group with a unique sound. To win the competition your group will need to create innovative instruments that make exciting and beautiful music. The competition requires that the group send the judges a thirty-second to one-minute audition tape and 1-2 minute overview of why your band is unique and how your instruments were constructed.

Role

You and a couple of friends have been interested in music for some time. Your group has decided to enter a competition looking for the next superstar musical group. To enter the competition, your group will need to make instruments that play music and you will also create a one-minute audition tape for the judges. Prior to your performance, your group will need to explain how the instruments were created and what makes your band unique.

Audience

Your audience will be superstar musicians serving as judges from around the world. They will be judging your instruments and sound based upon your innovativeness. The instruments must work together to make a musical sound that will excite people and make them want to listen to your music. The judges will be looking for an explanation as to how and why your instruments were created. They are also interested in what makes your group unique.

Situation

Your group has decided to create your own instruments. To do this you will need to understand how musical instruments create sound. You will also need to understand how musical instruments create a variety of sounds. Your instruments will need to make music that excites people to help you win the Rising Star competition. To create these instruments you will need to investigate properties of sound including waves, pitch, and frequency. Once you understand these properties it will be time to create your instruments and make beautiful music!

- The Blue Man Group is a band that creates all of their instruments. They are popular all over the world because of their unique sound and great music. The link below will show you the Blue Man Group using a few of instruments.
- https://www.youtube.com/watch?v=MEexbOjo3Yw

- STOMP is a show that has toured the world. The show features groups of people using everyday items to make music. These groups can be found all over the world performing and making people happy. The group uses a variety percussion and rhythm to excite people. The video below will show you how they do it.
- https://www.youtube.com/watch?v=US7c9ASVfNc

Now that you have seen a couple of examples; use your creativity and become the next group of rising stars!

Products

1. Prototype

Your group should construct a minimum of three different instruments. You will need to build these instruments using everyday items. This process may require you to create an instrument and make adjustments based upon the sound it produces. Do not get worried if your first version is not great. You will want to keep working until you have a version that sounds great and can help make you a star. Be sure to remember to consider how sound waves are reflected, absorbed, or transmitted through various materials.

- How is sound affected by different materials and how can it be reflected, absorbed and transmitted by these materials?
- How do different designs and shapes affect the sound and pitch that is produced?

Prototype - Creating A Superstar Musical Group: Making Sound

Achievement Levels	1	2	3	4
Model (x1)	The model is a minimally accurate with respect to the plans, diagrams, and/or drawings..	The model is a somewhat accurate reproduction of the plans, diagrams, and/or drawings. It has some detail and some critical components.	The model is a mostly accurate reproduction of the plans, diagrams, and/or drawings. It has attention to detail with some critical aspects in place.	The model is an accurate reproduction of the plans, diagrams, and/or drawings. It has great attention to detail.
Mathematical Practices in the Design Process (x1)	The product demonstrates minimal understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.	The product demonstrates some understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.	The product demonstrates adequate understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.	The product demonstrates strong understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.
Problem Solving (x1)	The model meets few needs and requirements set forth through the guidelines provided. The model accurately represents minimal aspects required.	The model meets the many of needs and requirements set forth through the guidelines provided. The model accurately represents some aspects required and solves those problems brought forth.	The model meets the majority of needs and requirements set forth through the guidelines provided. The model accurately represents most aspects required and solves those problems brought forth.	The model meets the needs and requirements set forth through the guidelines provided. The model accurately represents all aspects required and solves the problems brought forth.
Engineering Analysis (x1)	The student identifies potential engineering design flaws and provides an analysis of possible design solutions. The student makes an attempt at using mathematical concepts to create a working instrument.	The student identifies potential engineering design flaws, makes an attempt to develop a successful working prototype of a solution, and provides an accurate analysis of why their prototype did not work. The student uses mathematical concepts to create a working instrument.	The student identifies potential engineering design flaws, develops a somewhat successful working prototype of a solution, and provides an analysis of how they might improve their prototype. The student uses mathematical concepts to create a working instrument.	The student demonstrates strong understanding of the engineering process by identifying potential engineering design flaws through testing, developing a successful working prototype of a solution, and providing an in-depth analysis of their design process.
Sound and Waves (x1)	Prototype utilizes little understanding of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.	Prototype utilizes partial understanding of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.	Prototype utilizes satisfactory understanding of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.	Prototype utilizes strong understanding of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.

2. Scale Drawing

For each instrument, create a drawing of the instrument using measurements to help explain how each instrument produces sound and/or pitch including a demonstration of how the sound waves are reflected, absorbed, or transmitted through the materials selected.The drawings should be done first to help your team create their instruments. Remember, you will need to explain the reasons for the measurements you made and why these measurements are important for sound production in the development of your prototype.

- What shape and size should the instrument be?
- How will the shape and size affect the sound the instrument makes?
- What is the best material to use to make your instrument?

Scale Drawing - Creating A Superstar Musical Group: Making Sound

Achievement Levels	1	2	3	4
Mathematical Practices and the Design Process (x1)	The product demonstrates little understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.	The product demonstrates some understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.	The product demonstrates sufficient understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.	The product demonstrates strong understanding of the design process connected to the real world through excellent use of mathematical practices and concepts.
Engineering Design (x1)	Diagram demonstrates little understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Diagram demonstrates some understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Diagram demonstrates strong understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	
Drawing - details (x1)	The drawing is minimally supported by labels, measurements, attributes necessary to understand how the drawing represents the design.	The drawing is partially supported by labels, measurements, attributes necessary to understand how the drawing represents the design.	The drawing is adequately supported by labels, measurements, attributes necessary to understand how the drawing represents the design.	The drawing is thoroughly supported by labels, measurements, attributes necessary to understand how the drawing represents the design.
Sounds and Waves (x1)	Diagram lacks an accurate depiction of the process by which sound waves are transmitted, reflected or absorbed by various substances.	Diagram minimally depicts the process by which sound waves are reflected, transmitted or absorbed by various substances.	Diagram somewhat accurately depicts the process by which sound waves are reflected, transmitted or absorbed by various substances.	Diagram accurately depicts the process by which sound waves are reflected, transmitted or absorbed by various substances.

3. Group Introduction Video

Before your performance, you will need to create a 1-2 minute video explaining your process. Why were the instruments selected? How were they made? How do the instruments produce a variety of sounds? This explanation will be very important to the judges as they evaluate your group.

- What will be your band's name?
- What instruments will the group use to play their music and why were they selected?
- How do these instruments work?

Group Introduction Video - Creating A Superstar Musical Group: Making Sound

Achievement Levels	1	2	3	4
Engineering Design (x1)	Video demonstrates little understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the instrument(s).	Video demonstrates some understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the instrument(s).	Video demonstrates adequate understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the instrument(s).	Video demonstrates strong understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the instrument(s).
Support Materials (x1)	Contains non-aligned information, visuals, and/or video stories to help the viewer understand the purpose.	Contains minimally aligned information, visuals, and/or video stories to help the viewer understand the purpose.	Contains somewhat aligned and clear information, visuals, and/or video stories to help the viewer understand the purpose.	Contains aligned and clear information, visuals, and/or video stories to help the viewer understand the purpose.
Informational Presentation (x1)	The presentation is minimally constructed using little evidence based upon some scientific and engineering concepts.	The presentation is somewhat constructed using evidence based upon some scientific and engineering concepts emphasizing important points.	The presentation is adequately constructed using relevant evidence based upon scientific and engineering concepts and presented in a coherent manner emphasizing important points.	The presentation is thoroughly constructed using relevant evidence based upon scientific and engineering concepts and presented in a coherent manner emphasizing important points.
Sound and Waves (x1)	Video demonstrates minimally effective evidence of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.	Video demonstrates partially effective evidence of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.	Video demonstrates effective evidence of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.	Video demonstrate very effective evidence of the process by which sound waves are transmitted and absorbed by various substances to produce a musical sound.
Delivery (x1)	The video presentation is given with little command of language, eye contact, voice, pronunciation, and style appropriate to the audience.	The video presentation is given with some command of language, eye contact, voice, pronunciation, and style appropriate to the audience.	The video presentation is given with sufficient command of language, eye contact, voice, pronunciation, and style appropriate to the audience.	The video presentation is given with strong command of language, eye contact, voice, pronunciation, and style appropriate to the audience.

4. Diagram

Create a diagram that demonstrates how the sound is created from your musical instrument, moves through the air, and is heard by your ears. This diagram should serve as a model to describe how waves are reflected, absorbed, or transmitted through various materials.

This diagram will be important as the judges will be interested to learn this process and to see how you have connected scientific principles to your instrument.

- How is sound created by an instrument?
- How is sound produced by waves?
- How is sound reflected, absorbed and transmitted through various materials?

Diagram - Creating A Superstar Musical Group: Making Sound

Achievement Levels	1	2	3	4
Visual Model (x1)	The product provides minimal visual evidence to support the movement of waves through the instrument to make sounds.	The product provides some visual evidence to support the movement of waves through the instrument to make sounds.	The product provides sufficient visual evidence to support the movement of waves through the instrument to make sounds.	The product provides strong visual evidence to support the movement of waves through the instrument to make sounds.

Achievement Levels	1	2	3	4
Drawing Details (x1)	The drawing is minimally supported by labels, measurements, attributes necessary to understand how the drawing represents the design.	The drawing is partially supported by labels, measurements, attributes necessary to understand how the drawing represents the design.	The drawing is adequately supported by labels, measurements, attributes necessary to understand how the drawing represents the design.	The drawing is thoroughly supported by labels, measurements, attributes necessary to understand how the drawing represents the design.
Engineering Design (x1)	Diagram demonstrates minimal understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Diagram demonstrates some understanding of the criteria and constraints of the design problem with regard to size, material, and function of the product.	Diagram demonstrates adequate understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Diagram demonstrates strong understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.
Sounds and Waves (x1)	Diagram lacks an accurate depiction of the process by which sound waves are transmitted, reflected or absorbed by various substances.	Diagram minimally depicts the process by which sound waves are reflected, transmitted or absorbed by various substances.	Diagram somewhat accurately depicts the process by which sound waves are reflected, transmitted or absorbed by various substances.	Diagram accurately depicts the process by which sound waves are reflected, transmitted or absorbed by various substances.

5. Concert Poster

You will want to create a concert poster of your group to announce your first concert. Should you win the competition, and your group believes it will, your first concert will be happening soon. The concert poster should be an artistic picture of your group and the instruments that you play. Have fun creating the poster as it will represent your group to people in all the cities around the world your group hopes to play.

- What is the purpose of a concert poster?
- How do bands choose their names?
- What types of instruments are used together in different bands?

Concert Poster - Creating A Superstar Musical Group: Making Sound

Achievement Levels	1	2	3	4
Grammar and Mechanics (x1)	Grammar and sentence mechanics are not effective and do not reflect appropriate use of language.	Grammar and sentence mechanics are rarely effective and at times reflect appropriate use of language. Language does not fully engage the viewer and somewhat advances the purpose of the poster.	Grammar and sentence mechanics are somewhat effective and reflect appropriate use of language. Language attempts to engage the viewer and somewhat advances the purpose of the poster.	Grammar and sentence mechanics are effective and reflect appropriate use of language. Language used engages the viewer and advances the purpose of the poster.
Required Elements and Design Accuracy (x1)	Poster lacking required elements, a title, information appropriate for purpose and audience.	Poster contains some required elements, a title, inclusion of little information, appropriate for purpose and audience.	Poster contains most required elements, a title, inclusion of relevant information, appropriate for purpose and audience.	Poster contains all required elements, a clear title, relevant and accurate information, appropriate for purpose and audience.
Aesthetics (x1)	There is a no cohesive organization to the poster with no attempts at balance between the design elements.	There is a little cohesive organization to the poster with few attempts at balance between the design elements. The poster reflects somewhat effective use of space, color, texture, and shape.	There is a somewhat cohesive organization to the poster with attempts at balance between the design elements. The poster reflects effective use of space, color, texture, and shape.	There is a cohesive organization to the poster with balance between the design elements. The poster reflects very effective use of space, color, texture, and shape.
Graphics and	The graphics and visuals provide little evidence to support the purpose of the	The graphics and visuals provide some evidence to	The graphics and visuals provide adequate evidence to	The graphics and visuals provide strong evidence to

Achievement Levels	1	2	3	4
(x1)	musical group and their instruments and make the information provided easy for the viewer to understand.	support the purpose of the musical group and their instruments and make the information provided easy for the viewer to understand.	support the purpose of the musical group and their instruments and make the information provided easy for the viewer to understand.	support the purpose of the musical group and their instruments and make the information provided easy for the viewer to understand.
Engineering Design Representation (x1)	Poster demonstrates little understanding of the instrument(s) design including size and materials through the visual representations provided.	Poster demonstrates some understanding of the instrument(s) design including size and materials through the visual representations provided.	Poster demonstrates sufficient understanding of the instrument(s) design including size and materials through the visual representations provided.	Poster demonstrates strong understanding of the instrument(s) design including size and materials through the visual representations provided.

6. Musical Composition

With the help of your musical director, your group should compose a one-minute song that includes important parts of a musical arrangement. Your musical director can be an important part of this creation. Or if you choose you can create an improvisational piece of music. Improvisation means to compose and deliver without preparation. Remember, that this is a big competition and so your group should have some practice before the audition.

- What instruments will you use?
- How will you create your song?
- How is sound produced by waves and how is it reflected, absorbed and transmitted through various materials?

Musical Composition - Superstar Musical Group

Achievement Levels	1	2	3	4
Personal Music Ideas (x1)	The composition demonstrates minimally effective organization and construction of personal musical ideas through arrangements and compositions.	The composition demonstrates somewhat effective organization and construction of personal musical ideas through arrangements and compositions.	The composition demonstrates effective organization and construction of personal musical ideas through arrangements and compositions.	The composition demonstrates very effective organization and construction of personal musical ideas through arrangements and compositions.
Organization of Composition (x1)	The composition reflects a minimally effective beginning, middle and end to convey expressive intent.	The composition reflects a somewhat effective beginning, middle and end to convey expressive intent.	The composition reflects an effective beginning, middle and end to convey expressive intent.	The composition reflects a very effective beginning, middle and end to convey expressive intent.
Engineering Design (x1)	Composition demonstrates little evidence of the function and musical ability of the instrument(s) created and supported by the size and materials of the instrument(s).	Composition demonstrates some evidence of the function and musical ability of the instrument(s) created and supported by the size and materials of the instrument(s).	Composition demonstrates adequate evidence of the function and musical ability of the instrument(s) created and supported by the size and materials of the instrument(s).	Composition demonstrates strong evidence of the function and musical ability of the instrument(s) created and supported by the size and materials of the instrument(s).